

REMARKS

In the Office Action the Examiner noted that claims 1, 5-8, 10-34, 38-52, and 56 are pending in the application. The Examiner allowed claims 25, 28-30, 43-47, and 56, and rejected claims 1, 5-8, 10-24, 26-27, 31-34, 38-42, and 48-52. The Examiner's rejections are traversed below, and reconsideration of all rejected claims is respectfully requested.

Claim Rejections Under 35 USC §102

In items 3-8 on pages 2-4 of the Office Action the Examiner rejected claims 1, 23, 38-40, 49, and 51 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,721,579, issued to Ogasawara et al. (hereinafter referred to as "Ogasawara").

Claim 1 of the present invention recites:

A method of controlling power of a laser diode emitting laser light on a disc by using a difference between a level of the laser light reflected by the disc and a reference level, the difference being detected after the laser light level reflected by the disc is compared with the reference level, the method comprising:

generating a periodic synchronization signal; and
controlling the power of the laser diode in synchronism with the synchronization signal by:

sampling the difference between the level of the laser light and the reference level to produce a sampled difference,
calculating an average of a predetermined number of the sampled difference to produce an average compared result, and
controlling the power level of the laser diode according to the average compared result.

Therefore, the present application recites a method of controlling power of a laser diode emitting laser light on a disc including "sampling the difference between the level of the laser light and the reference level to produce a sampled difference, [and] calculating an average of a predetermined number of the sampled difference to produce an average compared result."

Thus, the level of the laser light is compared to a reference level, and the difference between the two values produces the sampled difference. A predetermined number of theses sampled differences are then used to calculate an average compared result to be used in controlling the power level of the laser diode. This feature is not disclosed in the image forming apparatus presented by Ogasawara.

Regarding claim 1, the Examiner stated:

Ogasawara discloses the invention as claimed [see Figs. 1-3, and 8-10], including generating a periodic synchronization signal and controlling the power of the laser diode

comprising the steps of:
generating a periodic synchronization signal [fig. 1, unblanking interruption] [col. 9, lines 16-50]; and
controlling the power of the laser diode in synchronism with the synchronization signal by:
sampling the difference between the level of the laser light and the reference level [fig. 1, V_t] to produce a sampled difference,
calculating an average [fig. 1, unit 64] of a predetermined number [4 points] of the sampled difference to produce an average compared result [fig. 1, unit 64], and
controlling the power level of the laser diode according to the average compared result [col. 9, line 6 to 65].

The Applicant respectfully disagrees with the Examiner's reading of Ogasawara. Referring to Figure 1, as cited by the Examiner, it is apparent that the "averaging of 4 points" (Element 64 of Figure 1) takes place before any value is compared to the "reference light intensity" (V_t of Figure 1). Therefore, only one value, i.e., the average value of the 4 points, is sent to the comparison unit (Element 44 of Figure 1) for adjustment before being sent to the APC processing unit (Element 65 of Figure 1). "[T]he detected laser beam intensity is read four times and the average of these values are calculated. The average value is then compared with a reference value V_t of the laser beam intensity, and the APC control is performed according to the difference between these two values" (Column 9, Lines 6-11).

This is in direct contrast to claim 1 of the present application, which recites "sampling the difference between the level of the laser light and the reference level to produce a sampled difference, [and] calculating an average of a predetermined number of the sampled difference to produce an average compared result." This allows multiple sampling of the level of the laser light during each of the synchronization signals, and the differences between each of these respective laser light levels and the reference level can then be used to calculate the average compared result. This allows great flexibility in the "predetermined number of the sampled difference," as recited in claim 1. An entire set of sampled differences collected during one synchronization signal could be used in calculating the average compared result, or a subset of the entire set of sampled differences could be used. Further, entire sets or various subsets of the entire sets of sampled differences from different synchronization signals could be used in calculating the average compared result. For example, eight of eight sampled differences from a current synchronization signal might be used with three of eight sampled differences from the previous synchronization signal to calculate the average compared result.

This is markedly different from the printing apparatus disclosed in Ogasawara, which uses a signal produced by comparing only one signal level with the reference level (Column 9, Line 6 through Column 10, Line 54). This is due to the fact that the only averaging of signals is

done before the single signal is sent to the comparison unit. Further, in the printing apparatus disclosed in Ogasawara, there is apparently only one sample of the signal level taken per each of the "unblanking interrupt requests" (which the Examiner has identified as the periodic synchronization signal). Ogasawara states in Column 10, Lines 38-48, that:

In the present embodiment, the detected laser beam intensity signal S40 is input four times, and these four values are averaged. In the shortest case, therefore, the routine reaches the averaging step 375 after four successive unblanking interrupt requests have been accepted. On the other hand, if some unblanking interrupt request ends in a n unfortunate result that the acquisition of a detected laser beam intensity signal S40 is not completed during a non-printing period (laser is in a forced turn-on state), then the averaging is performed after five or more unblanking interrupt requests have been accepted.

Therefore, only one signal level is apparently sampled per periodic synchronization signal in Ogasawara, and after at least four of these periodic synchronization signals the sampled signal levels are averaged into one value before being compared to the reference light intensity.

Therefore, Ogasawara does not disclose the feature of "sampling the difference between the level of the laser light and the reference level to produce a sampled difference, [and] calculating an average of a predetermined number of the sampled difference to produce an average compared result." Accordingly, Ogasawara does not recite every element of the Applicant's claim 1. In order for a document to anticipate a claim, the document must teach each and every element of the claim (MPEP §2131). Therefore, since Ogasawara does not teach the features recited in independent claim 1, as stated above, it is respectfully submitted that claim 1 patentably distinguishes over Ogasawara, and withdrawal of the §102(b) rejection is earnestly and respectfully solicited.

Claim 23 depends from claim 1 and includes all of the features of that claim plus additional features which are not taught or suggested by Ogasawara. Therefore, it is respectfully submitted that claim 23 also patentably distinguishes over Ogasawara.

Claim 38 also recites the feature of "sampling the difference between the level of the laser light and the reference level to produce a sampled difference, [and] calculating an average of a predetermined number of the sampled difference to produce an average compared result." Therefore, it is respectfully submitted that claim 38 also patentably distinguishes over Ogasawara.

Claims 39-40, 49, and 51 depend from claim 38 and include all of the features of that claim plus additional features which are not taught or suggested by Ogasawara. Therefore, it is respectfully submitted that claims 39-40, 49, and 51 also patentably distinguish over Ogasawara.

Claim Rejections Under 35 USC §103

In items 9-18 on pages 4-8 of the Office Action the Examiner rejected claims 7-8, 10-14, 24, 26, 31, 33, and 42 under 35 U.S.C. §103(a) as being unpatentable over Ogasawara in view of U.S. Patent No. 6,222,815, issued to Nagano (hereinafter referred to as "Nagano").

Claims 7-8, 10-11, 24, 26, 31, and 33 depend from independent claim 1, and claim 42 depends from independent claim 38. Accordingly the arguments presented above supporting the patentability of independent claims 1 and 38 in view of Ogasawara are incorporated herein. Nagano also fails to disclose or suggest "sampling the difference between the level of the laser light and the reference level to produce a sampled difference, [and] calculating an average of a predetermined number of the sampled difference to produce an average compared result." Accordingly, it is respectfully requested that claims 7-8, 10-11, 24, 26, 31, 33, and 42 patentably distinguish over the cited references.

Independent claim 12 recites:

An apparatus for controlling a power of a laser diode emitting laser light on a disc, comprising:

a photo diode which receives the laser light reflected by the disc to generate a current signal corresponding to a level of power of the reflected laser light;

a comparator which outputs an output voltage corresponding to the current signal from the photo diode compares the output voltage with a reference voltage and outputs a binary decision signal which indicates which of the output voltage and the reference voltage is higher;

an up/down counter which up/down counts the binary decision signal in accordance with the comparison result of the comparator to generate a count result;

a laser diode driver which controls a level of the power of the laser diode according to the count result of the up/down counter; and

an automatic power (APC) controller which controls an automatic power control of the laser diode, the APC controller being interposed between the up/down counter and the laser diode driver, the APC controller sampling the counted result from the up/down counter and latching an average of a predetermined number of the sampled counted results in synchronism with a periodic synchronization signal, and outputting the latch result to the laser diode driver.

In item 13, on page 6 of the Office Action, the Examiner listed the elements of claim 12 that the Examiner asserted were disclosed in Ogasawara. However, while the Examiner listed "the APC controller latching the count result of the up/down counter in synchronism with a periodic synchronization signal," the referenced claim language of independent claim 12 actually recites "the APC controller sampling the counted result from the up/down counter and latching an average of a predetermined number of the sampled counted results in synchronism with a

periodic synchronization signal." Similar to the earlier discussed arguments concerning independent claims 1 and 38, Ogasawara does not disclose the feature of "sampling the counted result from the up/down counter and latching an average of a predetermined number of the sampled counted results." As stated earlier, any averaging done by the printing apparatus of Ogasawara is done before any signal reaches the comparison unit, and therefore apparently before any signal reaches an up/down counter (which is part of the APC unit in Ogasawara). This deficiency of Ogasawara is not cured by Nagano. Therefore, it is respectfully submitted that the cited references, considered separately or together, fail to disclose or suggest the features recited in claim 12.

Claims 13 and 14 depend from claim 12 and include all of the features of that claim plus additional features which are not taught or suggested by the cited references. Therefore, it is respectfully submitted that claims 13 and 14 also patentably distinguish over the cited references.

In items 19-23 on pages 8-10 of the Office Action, the Examiner rejected claims 5-6, 15-22, 27, 32, 34, 41, 48, 50, and 52 under 35 U.S.C. §103(a) as being unpatentable over Ogasawara and Nagano and further in view of U.S. Patent No. 5,414,692, issued to Aoki (hereinafter referred to as "Aoki").

Claims 5-6, 22, 27, 32, and 34 depend from independent claim 1, and claims 41, 48, 50, and 52 depend from independent claim 38. Accordingly, the arguments presented above supporting the patentability of independent claims 1 and 38 in view of Ogasawara and Nagano are incorporated herein. Referring to Aoki, this reference describes an area FLAG which shows a flag region indicating that a write-in has been performed. An area ALPC (Auto Laser Power Control) shows a blank region, which is a test section for controlling the power level of a laser beam source (Column 1, Lines 40-53). However, similarly to Ogasawara and Nagano, Aoki is silent as to disclosing or suggesting "sampling the difference between the level of the laser light and the reference level to produce a sampled difference, [and] calculating an average of a predetermined number of the sampled difference to produce an average compared result," as recited in independent claims 1 and 38. Accordingly, it is respectfully submitted that claims 5-6, 22, 27, 32, 34, 41, 48, 50, and 52 patentably distinguish over the cited references.

Claims 15-21 depend from independent claim 12. Accordingly, the arguments presented above supporting the patentability of independent claim 12 in view of Ogasawara and Nagano are incorporated herein. Neither Ogasawara nor Nagano disclose the feature of "sampling the counted result from the up/down counter and latching an average of a predetermined number of

the sampled counted results," as recited in independent claim 12. This deficiency is not cured by Aoki. Accordingly, it is respectfully submitted that claims 15-21 patentably distinguish over the cited references.

Summary

It is respectfully submitted that none of the cited references, either taken alone or in combination, disclose or suggest the present claimed invention. Thus, claims 1, 5-8, 10-34, 38-52, and 56 are pending in the application.

There being no further outstanding objections or rejections, it is respectfully submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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